



# Use of elements of basketball as a means of psychomotor development of students

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## Abstract

**The aim** of the study: to develop and substantiate the methodology of using basketball to develop psychomotor abilities in the process of physical education of students.

**Material and methods.** The study involved first-year students (boys) who do not play sports but only attend physical education classes. The experimental group consisted of students who used basketball ( $n = 20$ ), the control group consisted of students who used other means (fitness, aerobics, etc.) ( $n = 20$ ). Prior to the experiment, the groups did not differ significantly. Duration of implementation of the method from January 2019 to December 2019. Test results were compared before and after the experiment.

**Results:** The results of the following tests of the experimental group showed statistically significant difference after the experiment: Long jump (sm) ( $p < 0.01$ ), Running 100 m (s) ( $p < 0.001$ ) (number of times) ( $p < 0.001$ , Ball and face forward 14x2m (s) ( $p < 0.001$ ), Static balancing (s) ( $p < 0.001$ ), Simple reaction time (s) ( $p < 0.001$ ). There was a decrease in the number of students with latent circulatory insufficiency after the experiment in the experimental group.

**Conclusion:** Experimental verification of the developed methodology for the development of psychomotor abilities by basketball revealed positive changes in the indicators of physical fitness, speed of reaction and special preparedness in basketball. Positive changes in the indicator of the functional status of the cardio-respiratory system of students were also observed.

**Keywords:** students; Physical Education; psychomotor abilities; basketball. Анотація

## Анотація

Лакно О.Г., Шиян О.В., Шиян В.М., Сологубова С.В., Шерман О.А. Використання елементів баскетболу як засобу психомоторного розвитку студентів.

**Мета дослідження** – розробити і обґрунтувати методику використання засобів баскетболу для розвитку психомоторних здібностей в процесі фізичного виховання студентів.

**Матеріал та методи.** В дослідженні взяли участь студенти першого курсу (хлопчики), які не займаються спортом, а відвідують тільки заняття з фізичного виховання. Експериментальну групу склали студенти, на заняттях яких застосовувався баскетбол ( $n=20$ ), контрольну групу склали студенти, на заняттях яких застосовувались інші засоби (фітнес, аеробіка тощо) ( $n=20$ ). До початку експерименту групи достовірно не відрізнялися між собою. Тривалість впровадження методики з січня 2019 по грудень 2019 р. Порівнювались результати тестування до та після експерименту.

**Результати:** Статистично достовірну різницю після проведення експерименту показали результати наступних тестів експериментальної групи: Стрибок у довжину з місця (см) ( $p < 0,01$ ), Біг 100 м (с) ( $p < 0,001$ ), Згинання та розгинання рук в упорі лежачи (кількість раз) ( $p < 0,001$ ), Ведення м'яча обличчям та спиною вперед 14x2м (с) ( $p < 0,001$ ), Статичне балансування (с) ( $p < 0,001$ ), Час простої реакції (с) ( $p < 0,001$ ). Спостерігалось зменшення кількості студентів з прихованою недостатністю кровообігу після проведення експерименту в експериментальній групі.

**Висновок:** Експериментальна перевірка розробленої методики розвитку психомоторних здібностей засобами баскетболу виявила позитивні зміни у показниках фізичної підготовленості, швидкості реакції та спеціальної підготовленості в баскетболі. Також спостерігались позитивні зміни показника функціонального стану кардіо-респіраторної системи студентів.

**Ключові слова:** студенти; фізичне виховання; психомоторні здібності; баскетбол і загострення (14,8%).

## Аннотация

Лакно О.Г., Шиян А.В., Шиян В.М., Сологубова С.В., Шерман А.А. Использование элементов баскетбола как средства психомоторного развития студентов.

**Цель исследования** - разработать и обосновать методику использования средств баскетбола для развития психомоторных способностей в процессе физического воспитания студентов.

**Материал и методы.** В исследовании приняли участие студенты первого курса (мальчики), которые не занимаются спортом, а посещают только занятия по физическому воспитанию. Экспериментальную группу составили студенты, на занятиях которых применялся баскетбол ( $n = 20$ ), контрольную группу составили студенты, на занятиях которых применялись другие средства (фитнес, аэробика и т.д.) ( $n = 20$ ). До начала эксперимента группы достоверно не отличались между собой. Продолжительность внедрения методики с января 2019 по декабрь 2019 сравнились результаты тестирования до и после эксперимента.

**Результаты.** Статистически достоверной разницы после проведения эксперимента показали результаты следующих тестов экспериментальной группы: Прыжок в длину с места (см) ( $p < 0,01$ ), Бег 100 м (с) ( $p < 0,001$ ), сгибание и разгибание рук в упоре лежа (количество раз) ( $p < 0,001$ ), Ведение мяча лицом и спиной вперед 14x2м (с) ( $p < 0,001$ ), Статическая балансировка (с) ( $p < 0,001$ ), время простой реакции (с) ( $p < 0,001$ ). Наблюдалось уменьшение количества студентов со скрытой недостаточностью кровообращения после проведения эксперимента в экспериментальной группе.

**Вывод:** Экспериментальная проверка разработанной методики развития психомоторных способностей средствами баскетбола обнаружила положительные изменения в показателях физической подготовленности, скорости реакции и специальной подготовленности в баскетболе. Также наблюдались положительные изменения показателя функционального состояния кардио-респираторной системы студентов.

**Ключевые слова:** студенты; физическое воспитание психомоторные способности; баскетбол



## Introduction

In recent years, the accumulation of knowledge and skills about self-development, self-improvement of personality have become very popular among young people. Courses, online courses, workshops, seminars help you acquire any knowledge from language learning and memory development to spiritual practices. Also, more and more young people are interested in healthy lifestyles as a whole and separately in healthy eating and playing sports. More and more sports, equipment are emerging, and techniques for improving and improving the human body are becoming more and more diverse. Increasing the diversity of human activity leads to an increase in mental activity and stress on the psyche and nervous system as a whole. Thus, there is a need for activities that help to increase brain capacity and satisfy the cognitive needs of student youth.

Against the background of these statements, classical physical education classes lose their relevance [1, 2]. Therefore, in the field of physical education a huge amount of research in the last decades is devoted to the development of relevant and interesting classes for students [3-5]. Most studies are aimed at developing students' physical fitness through innovative tools and methods [6-9]. There are also a number of studies on the complex impact on the physical and psychological development of young people and students in particular [10-12]. However, in our opinion, this research is not enough to improve the student's physical education process and increase interest in it.

Basketball is a popular sport game that is beyond doubt. The number of basketball teams and their fans both in the world and in our country testify to this. It is also known that basketball is a complex coordination, speed and team game that requires players not only physical effort but also great intellectual ability [13,14]. Having analyzed these statements, we can assume that the development of psychomotor abilities by basketball means can positively affect both the functional state of the body and the attitude of students to physical education [15,16].

Many prominent scientists have dedicated their work to the relationship between physical and intellectual development. The well-known physiologist Sechenov [17] has done basic research, revealed the important role of the muscular movement in the knowledge of the outside world and defined the concept [17]. Many years ago, such prominent scientists as Bernstein [18] and Lezgaft [19] identified the importance of the unity of the

physical and mental spheres of man as a foundation for the highest self-regulation of his motor activity.

Let us dwell on the detailed characterization of psychomotor and its relation with the concepts of "psychomotor qualities", "psychomotor abilities", "psychomotor activity" [20, 21].

Sechenov proved that in connection with psychomotor activity is the practical activity, efficiency and activity of the psyche. The notion of the functions of the motor centers of the cerebral cortex gained new meaning when a new interpretation of the concept of "psychomotor" was introduced into scientific use - as the integrity of mind and body, the unity of its mental and physical sphere. The scientist also noted that arbitrary movements of a person are inevitably associated with such a psychic phenomenon as motive. The first stage of the movement is thought, and later the movement itself. Therefore, without desire or thought, the movement is performed automatically [17]. The ideas of the scientist have played a decisive role in the understanding of psychomotor, which integrates all analyzer systems of man [21, 22].

Over time, several definitions of the concept of "psychomotor" emerged, psychomotor is the main type of objectification of the psyche in sensory, ideomotor and emotional motor reactions and acts. psychomotor - the ability of a person to display objective information about their motor activity, accurately control their movements and effectively manage them; psychomotor - the objective perception of the person of all forms of mental reflection, beginning with the sensation and ending with complex forms of intellectual activity; psychomotor - is the objectification of all forms of mental reflection through muscle movements; psychomotor - a set of arbitrary, consciously controlled motor actions [22-24].

The process of physical education of students involves determining the effectiveness of the use of tools aimed at improving not only indicators of physical fitness, but also indicators of psychophysiological capabilities, since psychophysiological testing reflects one of the aspects of the functional state of the organism [20, 23, 24].

**The aim** of the study: to develop and substantiate the methodology of using basketball to develop psychomotor abilities in the process of physical education of students.

## Material and methods

### *Participants*

The study involved first-year students (boys) who do not play sports but only attend physical



education classes. The experimental group consisted of students who used basketball ( $n = 20$ ), the control group consisted of students who used other means (fitness, aerobics, etc.) ( $n = 20$ ). Prior to the experiment, the groups did not differ significantly (Table 3).

### *Procedure*

Duration of implementation of the method from January 2019 to December 2019. Before the experiment, all participants of the experiment were tested and their functional status was evaluated. The students were then divided into control and experimental groups and an experiment was conducted. At the end of the experiment, students were tested again. Test results were compared before and after the experiment.

In the course of pedagogical research, the method of development of psychomotor qualities with the use of basketball was applied at physical education classes. The purpose of the study was to determine the effectiveness of the impact of the proposed method on the psychophysiological indicators, the level of physical training and determine the response of the cardio-respiratory system of students to the physical activity.

First, the level of development of students' physical qualities was determined at the group level ( $n = 40$ ) by the control tests, namely: coordination abilities - static balancing (c). "Explosive" force - a long jump from a place (cm); speed abilities - running 100 m (s); absolute strength - flexing and extending the arms in the resting position (number of times). Basketball tests were also used for selection to the basic training stage: running backwards 10m (s) and running the ball face and back 14h2m (s).

Tests for simple reaction time (c), complex reaction time (c), tapping test (number per second), static balancing (c) allowed to analyze the psychophysiological development of students [5, 23]. Statistical balancing was performed as follows. The subject took the starting position standing on one leg, the other leg was lifted forward in a knee-bent position. The time from the beginning of the test to the equilibrium loss and the touching of the floor with the foot was recorded. Tests for determining the time of simple and complex reaction to the light indicator were carried out according to the program "Psychodiagnostics" [25].

Serkin's test was used to record functional status [26].

### *Serkin test (three-phase respiratory retention)*

The inhalation delay is performed with an air volume of approximately  $2/3$  of the maximum possible inhalation. Before the test, take 3-5 minutes to rest and take 2-3 deep breaths. It is better to clamp your nose with your fingers. From time to time, respiratory arrest until termination.

Phase One: After a 5-minute sitting sitting, determine the time of breath-holding in the sitting position.

Second phase: then perform 20 sit-ups in 30 seconds (standardized load) and repeat the breathlessness of breath while standing.

The third phase: after resting for one minute, repeat the first phase for one minute - to determine the time of holding the breath to breath in the sitting position.

Scheme of evaluation of the Sirkin sample is presented in table 1.

*Table 1*

Criteria for evaluating the results in the Serkin test

Assessment of the functional state of the time of respiratory retention (s)	The first phase	The second phase	The third phase
Healthy trained people	60 and more	30 and more	60 and more
Healthy untrained people	40-55	15-25	35-55
People with latent circulatory insufficiency	20-35 and less	14 and less	34 and less

### *Methods of development of psychomotor abilities by means of basketball in the process of physical education of students*

The process of physical education of students may involve determining the effectiveness of the use of facilities aimed at improving not only indicators of physical fitness, but also indicators of

psychophysiological capabilities, since psychophysiological testing reflects one of the aspects of the functional state of the organism.

The development of connections between nerve cells depends on the loading of the brain with information and influences the subsequent formation throughout the period of individual human development. In order to improve the state of psychomotor abilities, we were offered exercises that



promote the development of brain activity. The proposed exercises are aimed at creating new neural connections and connections between the hemispheres of the brain.

Thus, bimanual exercises for small motor skills were offered to students as independent lessons for each day and were performed for about 5 minutes, as well as in the preparatory and final part of the physical education class.

Exercises: - Accountant;

- everything is "okay";
- where is the thumb;
- Chinese exercise;

Exercises for major motor skills were included in the complex of general developmental exercises in the preparatory part of the lesson.

Exercises: - Japanese exercise;

- wheel;
- Indian exercise.

Ball exercises were included in a set of special exercises in the preparatory part of the class.

During the exercises students are asked to give oral answers to simple questions (multiplication table, riddles, definitions, etc.) or to play the game "Rainbow" (in different colors, color names are written, it is necessary to read the color, not to name the color in which it is written). Each exercise is performed about 2 minutes.

Exercises: - catching the ball behind the back (hands, elbows);

- throwing the ball with two hands from behind the back through the head
- throwing the ball while holding the ball in a straight hand;
- hand ball (right and right hand ball balance)

Exercises were included in the set of special exercises in the main part of the class.

During the exercises, students are encouraged to speak a poem aloud or sing a song or give oral answers to simple questions (multiplication table, riddles, definitions, etc.).

First two weeks (1-4 sessions) with 1-1.30 minutes with right and left hands:

- keeping the ball in place and in motion;
- running the ball face and back forward;

The next three weeks (5-10 sessions) for 1-1.30 minutes with right and left hands:

- keeping the ball in pairs synchronously and not synchronously;
- Keeping two balls synchronous and not synchronous;

The next three weeks (11-16 sessions) for 1-1.30 minutes with right and left hands:

- translation of the ball under the foot;
- keeping the ball balanced on a narrow surface;

- keeping the ball balancing on the balance platform;

The following exercises are performed by the instructor or partner (called the size or color of the ball, the color or number of the bag or chips). Each exercise is performed for 2-3 minutes.

- partner throws as a simulation of throws in the basket;
- throws in the basket from near and medium distance with different balls on the task;
- moving in a protective rack to balls with numbers by task;
- moving and translating bags with numbers of different colors by task lying flat.

## Results

The results obtained before the start of the experiment in the test "long jump from place" indicate a low level of development of explosive power in students, only 4% of the examinees have an average level of development of explosive force. In the 100m test, the average value is 13.7 s, which indicates the average level of speed development. The results of the "flexion of arm flexion in the emphasis resting" test indicate a level lower than the average, because 100% of students completed the test accordingly, and the average is 21.7 times. And in the "static balancing" test, 50% of students showed a high level of 30% average, and only 20% low, the average value was 49.1 s (Table 2).

Assessing the functional state of the first-year student's respiratory system based on the results of the Sarkin test before the experiment, we found that 40% of students have latent circulatory insufficiency and 60% are healthy, not trained (Fig. 1). This is typical for both control and experimental students.

### *Influence of classes using the method of development of students' psychomotor abilities by means of basketball*

The analysis of the results of measurements of indicators of psychomotor development after the experiment showed that the implementation of our developed methodology for the development of psychomotor abilities by basketball helped to increase the level of their manifestation in the EG students. A statistically significant difference after the experiment was shown by the results of the following tests of the experimental group: Long jump from place (cm) ( $p < 0.01$ ), Running 100 m (s) ( $p < 0.001$ ), Flexing and extending the arms in resting (number times) ( $p < 0.001$ ), Ball and face forward 14x2m (s) ( $p < 0.001$ ) (Static balancing (c) ( $p < 0.001$ ), Simple reaction time (c) ( $p < 0.001$ ) (Table 3 In the





control group, a smaller number of significantly improved test scores were found: Flexing and extending the arms at rest (number of times) ( $p < 0.01$ ), Simple reaction time (s) ( $p < 0.01$ ).

After the experiment, the control and experimental groups began to differ significantly in the tests: Running 100 m (s) ( $p < 0.001$ ), bending and extending hands in the emphasis lying (number of times) ( $p < 0, 01$ ), Backstroke 10m (s) ( $p < 0.001$ ), Face Ball and Back 14h2m (s) ( $p < 0.001$ ), Static Balancing (s) ( $p < 0.001$ ), Simple Reaction Time (s) ( $p < 0.01$ ) (Table 3).

In addition, there was a decrease in the number of students with latent circulatory insufficiency after the experiment in the experimental group (Fig. 2). The functional state of the students' respiratory system after the experiment testifies to the effectiveness of the influence of the method of psychomotor development by the means of basketball in the physical education classes. Thus, this indicator in students with latent circulatory insufficiency decreased by 10%, and the percentage of healthy, non-trained increased to 30% and 70% respectively (Fig. 2).

Table 2

Indicators of physical fitness and level of development of students' psychophysiological abilities to experiment at the group level (n=40)

N	Control tests	$\bar{x}$	S
1	Long jump (cm)	192	8,56
2	100m Run (s)	13,7	0,83
3	Push-ups (times)	21,7	3,09
4	Running Back 10m (s)	3,2	0,94
5	Ball dribbling 2x14m (s)	12,8	2,4
6	Static balancing (s)	49,1	12,69
7	Simple reaction time (s)	0,228	0,003
8	Complex reaction time (s)	0,323	0,004
9	Tapping test (number per second)	5,9	0,13

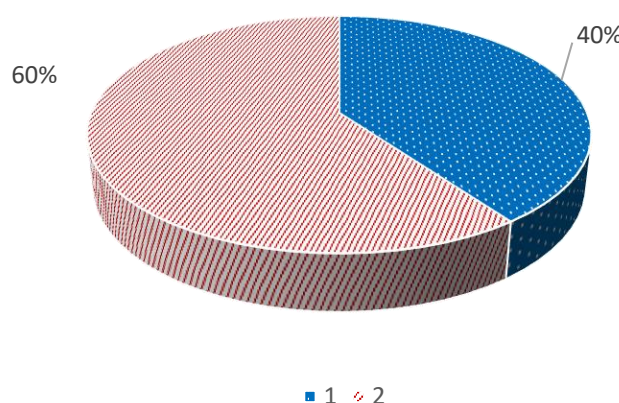


Fig. 1. Response of the respiratory system to the physical activity of students of the experimental group to the experiment (Sarkin test):

- 1 - latent circulatory insufficiency;
- 2 - healthy, not trained



Table 3

Indicators of physical fitness and level of development of students' psychophysiological abilities to experiment

N	Control tests / intergroup comparison	Group	$\bar{X} \pm S$ before the experiment	$\bar{X} \pm S$ after the experiment	Increase (%)	t	P
1	Long jump (sm)	c	188,0 ± 4,0	188,0 ± 3,9	0,0%	0,00	p>0,05
		e	186,0 ± 3,0	189,0 ± 3,0	1,61%	-3,16	p<0,01
	Intergroup comparison	t	1,79	-0,91	-	-	-
		P	p>0,05	p>0,05	-	-	-
2	Long jump (sm)	c	14,9 ± 0,2	14,8 ± 0,2	0,67%	1,58	p>0,5
		e	14,8 ± 0,1	14,4 ± 0,1	2,7%	12,65	p<0,001
	Intergroup comparison	t	2,00	8,00	-	-	-
		P	p>0,05	p<0,001	-	-	-
3	Push-ups (times)	c	15,0 ± 1,0	16,0 ± 1,0	6,67%	-3,16	p<0,01
		e	14,8 ± 0,6	17,0 ± 0,6	14,8%	-11,60	p<0,001
	Intergroup comparison	t	0,77	-3,83	-	-	-
		P	p>0,05	p<0,01	-	-	-
4	Running backwards 10m	c	3,2 ± 0,2	3,2 ± 0,2	0,00%	0,00	p>0,05
		e	3,2 ± 0,1	2,9 ± 0,1	9,4%	9,49	p>0,001
	Intergroup comparison	t	0,00	6,00	-	-	-
		P	p>0,05	p<0,001	-	-	-
5	Ball dribbling 2x14m (s)	c	12,8 ± 0,6	12,8 ± 0,6	0,00%	0,00	p>0,05
		e	12,9 ± 0,6	9,5 ± 0,6	26,3%	17,92	p<0,001
	Intergroup comparison	t	-0,53	17,39	-	-	-
		P	p>0,05	p<0,001	-	-	-
6	Static balancing (s)	c	49,1 ± 0,5	49,3 ± 0,4	0,41%	-1,40	p>0,5
		e	48,9 ± 0,5	53,6 ± 0,7	9,61%	-24,43	p<0,001
	Intergroup comparison	t	1,26	-23,85	-	-	-
		P	p>0,05	p<0,001	-	-	-
7	Simple reaction time (s)	c	0,228 ± 0,003	0,225 ± 0,002	1,32%	3,72	p<0,01
		e	0,229 ± 0,003	0,223 ± 0,002	2,6%	7,44	p<0,001
	Intergroup comparison	t	-1,05	3,16	-	-	-
		P	p>0,05	p<0,01	-	-	-
8	Complex reaction time (s)	c	0,320 ± 0,004	0,321 ± 0,003	0,31%	-0,89	p>0,5
		e	0,321 ± 0,005	0,321 ± 0,003	0,00%	0,00	p>0,5
	Intergroup comparison	t	-0,70	0,00	-	-	-
		P	p>0,05	p>0,05	-	-	-
9	Tapping test (number per second)	c	6,5 ± 2,0	6,7 ± 2,0	3,08%	-0,32	p>0,5
		e	6,4 ± 2,0	6,2 ± 2,0	3,13%	0,32	p>0,5
	Intergroup comparison	t	0,16	0,79	-	-	-
		P	p>0,05	p>0,05	-	-	-

Note: C - the control group; E is an experimental group

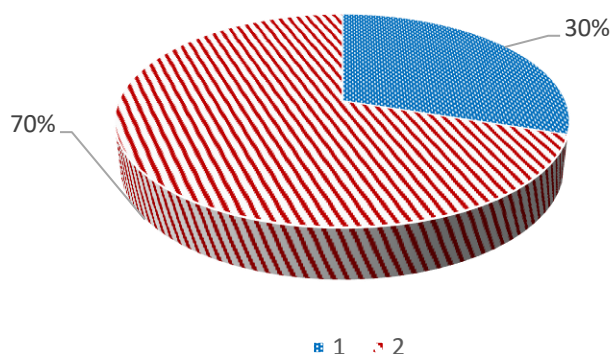


Fig. 2. Respiratory system response to physical activity of students in the experimental group after the experiment (Sarkin test):

- 1 - latent circulatory insufficiency;
- 2 - healthy, not trained

## Discussion

The effectiveness of the proposed methodology is evidenced by pedagogical observation, as a result of which we found a significant increase in the emotional background of the classes and as a consequence of increasing the motivation for physical education. In our opinion, this factor greatly influenced the improvement of the functional state of the students' respiratory system. In addition, basketball is an aerobic-anaerobic work with a pronounced glycolytic component, and it is no coincidence that the cardio-respiratory system's students have increased their cardiovascular respiratory system performance more than non-basketball students. A number of studies have found that basketball is a variable work with different periods of loading and rest [27, 28]. Basketball is a variable work of aerobic-anaerobic orientation. Basketball, in terms of physiological characteristics, is a continuous alternation of "active" and "passive" phases. During the "active" phases, the basketball player performs jerks (for example, with a quick breakthrough, opening to get the ball, fighting for rebound, active defensive actions, etc.), and during "passive" - there is a relative rest: basketball player does not engage in active tactics (for example, not engaged in a rapid breakthrough, waits for the moment of entering the 3-second zone, rests for a few seconds after making throws or gears, as well as during free throws and minute breaks). On average, the duration of the sequential active and passive phases of the game approaches 30 s [27, 28], which is the work of variable intensity.

Shift work with load and rest periods of 5-10 seconds is more difficult for the body compared to constant work of equal total power and less

productive. However, shift work with thirty-second periods of activity and rest is more stressful for the body compared to work with 5-10-second periods [27]. Judging basketball as a variable work with 30-second periods, it can be said that this game puts higher demands on the body than, for example, a uniform running of medium intensity [28]. Basketball is a job that places high demands on the level of functional training as a variable intensity load. This is a factor of increased influence on the cardiovascular system [26, 27]. Comparing basketball with loads in cyclic sports, the most appropriate comparison is jogging, and in particular, running at 400 m. Basketball, like running at a given distance, is an anaerobic-glycolytic work [28]. In the first minutes of the game, all players, regardless of role, oxygen consumption is 50-70% of the maximum, the heart rate is increased to maximum values [27].

The results also confirm the study by Baribina, Kozina [9] that the speed of perception and response characterizes the properties of the neuromuscular system, genetically predetermined and little amenable to training. It is also known that psychophysiological processes such as the speed of a person's reactions are conditioned by the mobility of their nervous processes, and the frequency of movements depends on the mobility of the neuromuscular apparatus: the frequency of the neuromuscular impulse, the rate of transition of the muscles from the phase of tension to the phase of relaxation, the rate of alternation of these phases, the degree of incorporation into the process of movement of "fast" muscle fibers and their synchronous operation, therefore, the acceleration and correction of these processes is best performed in the sensitive period from about 7 to 12 years. Thus, the data obtained show that, despite the age of the tested 17-18 years (ie much more than the sensitive periods of development of psychomotor qualities), basketball had a positive impact on this indicator.



## Conclusions

1. It is determined that as a result of the use in the educational process of physical education of the developed methodology of development of psychomotor abilities by means of basketball, there were positive changes in the indicators of physical training, reaction rate and basketball tests. Positive changes in the indicator of the functional status of the cardio-respiratory system of students were also observed.

2. A statistically significant difference after the experiment was shown by the results of the following tests of the experimental group: Long jump from a place (sm) ( $p < 0.01$ ), Running 100 m (s) ( $p < 0.001$ ), Flexing and extending of hands in emphasis lying (number of times) ( $p < 0.001$ ), Ball and face forward 14x2m (s) ( $p < 0.001$ ), Static balancing (s) ( $p < 0.001$ ), Simple reaction time (s) ( $p < 0.001$ ). In the control group, a smaller number of significantly improved test scores were found: Folding and extending the

arms at rest (number of times) ( $p < 0.01$ ), Simple reaction time (s) ( $p < 0.01$ ). After conducting the experiment, the control and experimental groups began to differ significantly in the tests: Running 100 m (s) ( $p < 0.001$ ), Bending and extending hands in the emphasis lying (number of times) ( $p < 0.01$ ), Running back forward 10m (s) ( $p < 0.001$ ), Ball and face forward 14x2m (s) ( $p < 0.001$ ), Static balancing (s) ( $p < 0.001$ ), Simple reaction time (s) ( $p < 0.01$ ). The positive influence of using the technique of development of psychomotor abilities by basketball means on the functional state of the cardio-respiratory system has been determined.

## Conflict of interest

Authors state that there is no conflict of interest.

## References

1. Gruzhevsky VO. The feasibility of using innovative technologies in the formation of student-oriented motivation of students to physical education. Pedagogy, psychology and medical and biological problems of physical education and sports. 2014;(3):19-24. (in Ukrainian) doi:10.6084/m9.figshare.936958
2. Futorny SM Theoretical and methodological bases of innovative technologies of formation of healthy way of life of students in the process of physical education [dissertation]. Kyiv: National Nat. University of Phys. cult. and sports; 2015. 553p. (in Ukrainian)
3. Nikolaev Y, Nikolaev S. Determination of the level of physical fitness and physical activity of students of the first courses of study and girls of graduating 11th grade (entrants) Physical education, sports and culture of health in modern societies. of sciences. Volin Ave. nat. Univ. Lesya Ukrainka. 2010; 3 (11): 39–43. (in Ukrainian)
4. Anischenko V S. Physical education: methodical and practical classes of students Moscow: RUDN University; 1999.158 p. (in Russian)
5. Krutsevich TYu. Methods of researching the individual health of children and adolescents in the process of physical education Kiev: Olympic literature, 1999. 232p. (in Russian)
6. Kondratyuk S M Features of psychomotor activity of students in the process of adaptation to learning [author. diss.]. Ostrog: Nat. Acute Acadus University; 2013. 167p. (in Ukrainian)
7. Odaynik V V Basketball as one of the main means of development of coordination abilities of students of higher educational establishments in the conditions of modern education system. Bulletin of Kamyanets-Podilskyi Ivan Ogiyenko National University. Physical education, sports and human health. 2018; 268-273. (in Ukrainian)
8. Platonov KK. Psychological Workshop Moscow: Higher School; 1980.165p. (in Russian)
9. Barybina LN, Kozina ZL Characteristic of the psychophysiological indicators of students of various sports specializations. Physical education of students. 2010; (4): 6-11 (in Russian)
10. Kozina J L, Delova I, Lyashenko A, Kolomiets N A. Characterization of psychophysiological indicators in swimmers in fins and basketball players. Physical education of students of creative specialties: collection of scientific works under the editorship of prof. Ermakova SS. 2006; (6): 20-26. (in Russian)
11. Lisenchuk G, Zhigadlo G, Tushchenko V, Odynets T, Omelianenko H, Pyptiuk P, Bessarabova O, Galchenko L, Dyadechko I. Assess psychomotor, sensory-perceptual functions in team-sport games / Journal of Physical Education and Sport. 2019;(19):1205-1212. <http://repository.ldufk.edu.ua/handle/34606048/22183>
12. Yanenko LI. Psychomotor development of students in physical education by rhythmic means. In: scientific achievements and discoveries 2019 collection of articles of the IX International Research Competition. Part 1. [Internet]; 2019 April 10; Penza Penza: ICSN "Science and Enlightenment"; 2019 p. 288-290. Доступно на <https://naukaip.ru/wp-content/uploads/2019/04/%D0%9A-156-%D0%A7%D0%B0%D1%81%D1%82%D1%8C-1.pdf> (in Russian)
13. Koryagin V M, Mukhin V N, Bozenar V A, Mozola R S. Basketball: textbook. benefits Kiev: High School; 1989.232p. (in Russian)
14. Zheleznyak Yu D, Porshov Yu M, Savin V L, Lexakov A V, ed. Zheleznyak Yu D, Portnova Yu M. Sporting games: technique, training tactics: textbook. for stud. higher ped textbook. Moscow: Academy; 2001.520p. (in Russian)
15. Valtin A I. Problems of modern basketball. Kiev: In Yure; 2003.150p. (in Russian)
16. Burak G, Erdoğan Y. The Effect of Tactical Games Approach in Basketball Teaching on Cognitive, Affective and Psychomotor Achievement Levels of High School Students Education and Science 2019, Vol 44, No 200, 313-331/ DOI: 10.15390 / EB.2019.8163
17. Sechenov IM. Elements of thought. Peter: St. Petersburg; 2001.416p. (in Russian)
18. Bernstein NA. On the construction of movements. Moscow: Medits.; 1947.256 p. (in Russian)
19. Bernstein NA. About agility and its development. Moscow: Physical education and sport; 1991.288p. (in Russian)
20. Klimenko VV. Psychomotor abilities of a young





- athlete Kiev: Health; 1987.165p. (in Russian)  
[http://nbuv.gov.ua/UJRN/Nchnpu\\_015\\_2015\\_3%282%29\\_\\_112](http://nbuv.gov.ua/UJRN/Nchnpu_015_2015_3%282%29__112)
21. Klimenko VV Psychophysiological mechanisms of human praxis: monograph Kiev: Slovo Publishing House; 2013. 640c. (in Ukrainian)
22. Shinkaryuk AI. Psychomotor structure of activity and freedom of the subject Kamianets-Podilskyi: Oyum; 2005. 448 p. (in Ukrainian)
23. Tishchenko VO. Innovative tests for determining the level of psychomotorism in sports games. Scientific journal of MP Dragomanov NPU. Series 15: Scientific and pedagogical problems of physical culture (physical culture and sports). 2015;3(2):335-337 (in Ukrainian)  
[http://nbuv.gov.ua/UJRN/Nchnpu\\_015\\_2015\\_3%282%29\\_\\_112](http://nbuv.gov.ua/UJRN/Nchnpu_015_2015_3%282%29__112)
24. Maman P, Kanupriya G, Jaspal S S. Role of Biofeedback in Optimizing Psychomotor Performance in Sports. Asian J Sports Med. 2012 Mar; 3(1):29-40 doi: 10.5812/asjms.34722
25. Iermakov SS, Kozina ZL, Ceslitska M, Mushketa R, Krzheminski M, Stankevich B. Razrabotka kompyuternykh programm dlya opredeleniya psihofiziologicheskikh vozmozhnostey i svoystv nervnoy sistemy lyudey s raznyim urovnem fizicheskoy aktivnosti [Computer program development for determination of psychophysiological possibilities and properties of the nervous system of people with the different level of physical activity]. Zdorov'ya, sport, reabilitaciya [Health, sport, rehabilitation]. 2016;1:14-9.
26. Kozina ZhL, Koval KA, Vasilyev YuK. Development of endurance of young athletes of 12-13 years in cycling in the initial stage of training. Health, sport, rehabilitation, 2019; 5(1): 47-55. doi:10.34142/HSR.2019.05.01.05
27. Kozina Z. The system analysis algorithm in scientific research in the field of sports games. Physical education of students of creative specialties. 2006 (4): 15-26.
28. Kozina Z. Methods of applying modern information technology to enhance the imaginative perception of elements of technology and tactics in sports games. Pedagogy, psychology and biomedical problems of physical education and sport. 2007; (1): 58-64.

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